

Humans Fire & Climate

A Case Study of Lac La Croix's Fire History

Photo: Rob Focht, USFS



Kurt Kipfmueeller & Lane Johnson

Department of Geography
University of Minnesota

Photo: Evan Larson, UW-Plattevi

AN ASSESSMENT OF THE DENDROCLIMATIC POTENTIAL OF THREE CONIFER SPECIES IN NORTHERN MINNESOTA

KURT F. KIPFMUELLER^{1*}, GRANT P. ELLIOTT², EVAN R. LARSON³, and MATTHEW W. SALZER⁴

¹Department of Geography, University of Minnesota, Minneapolis, MN 55455, USA

²Department of Geography, University of Missouri, Columbia, MO 65211, USA

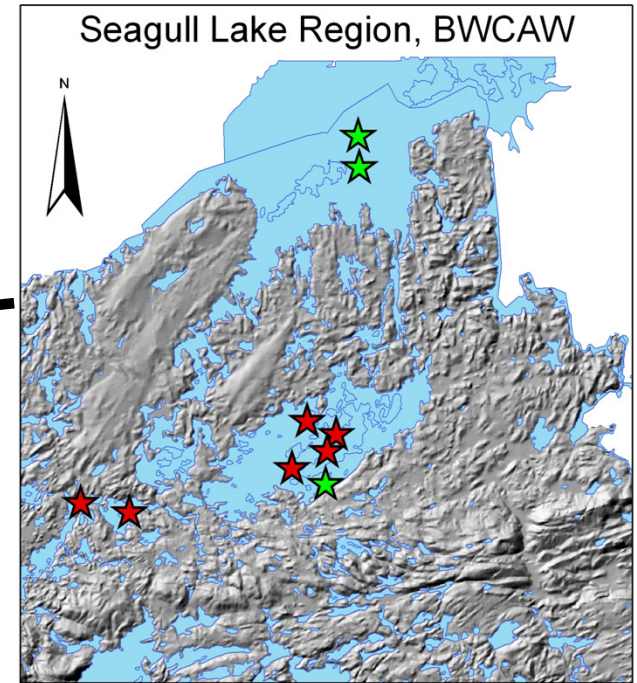
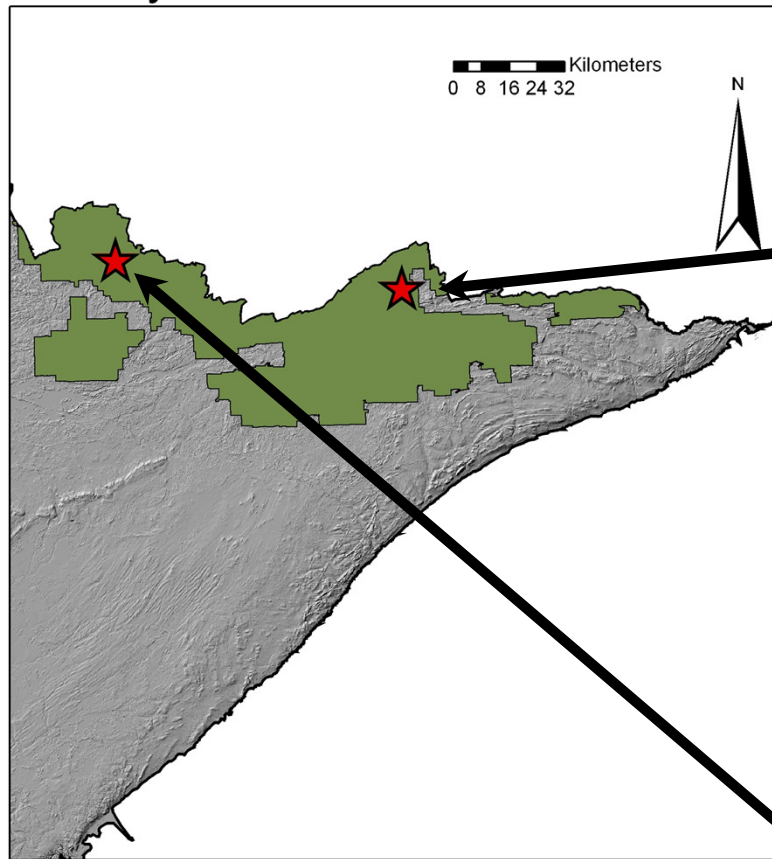
³Department of Social Sciences, University of Wisconsin-Platteville, Platteville, WI 53818, USA

⁴Laboratory of Tree-Ring Research, University of Arizona, Tucson, AZ 85721, USA

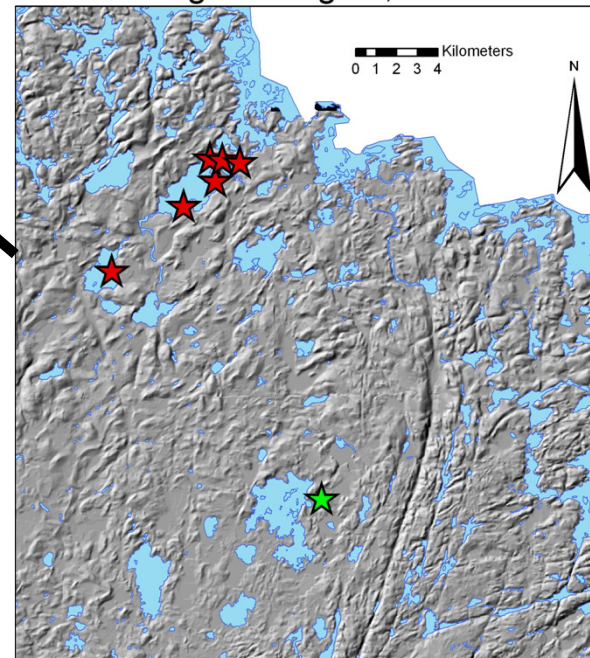
ABSTRACT

Ring-width chronologies from *Pinus resinosa* Ait., *Pinus strobus* L., and *Thuja occidentalis* L. were developed in two areas of the Boundary Waters Canoe Area Wilderness to assess their growth-climate response and their potential for developing reconstructions of climate. New red pine chronologies were combined with existing chronologies to extend the ring-width record both into the past and into the present. Ring-width response to climate, assessed using correlation analysis and response functions, was broadly similar among all three species with relatively significant positive relationships with June–July precipitation and significant negative (but less consistent) associations with June–July temperatures ($p < 0.05$). White-cedar appeared to have a broader phenological window of response with a stronger spring influence when compared to other species included in this study. Comparisons with other nearby proxies showed relatively strong coherence overall but with some important regional differences. Overall, these species may be useful for placing current climatic patterns in the Boundary Waters within a longer term perspective but care should be taken with respect to identifying appropriate climatic records for calibration.

Boundary Waters Canoe Area Wilderness

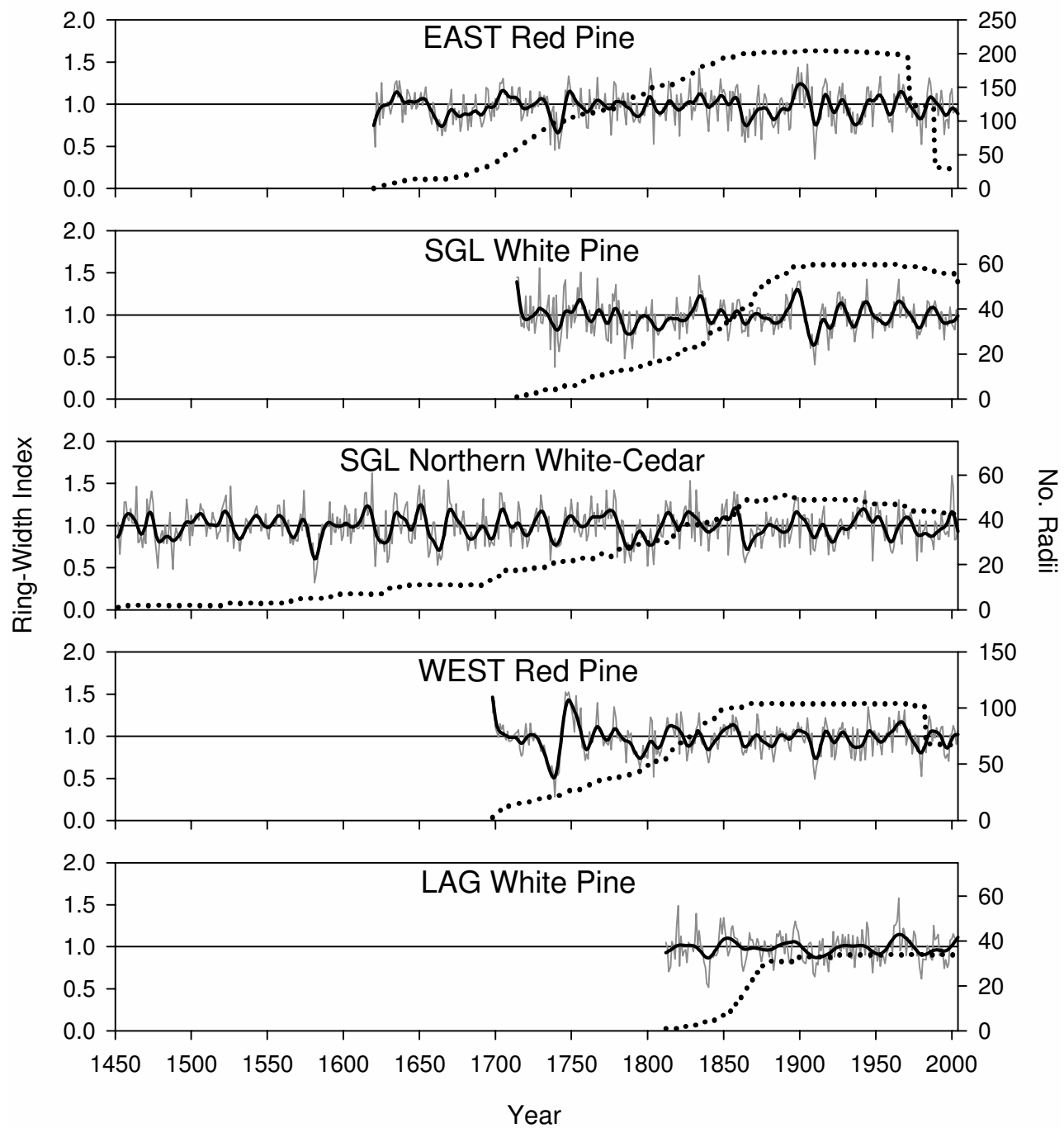


Lake Agnes Region, BWCAW

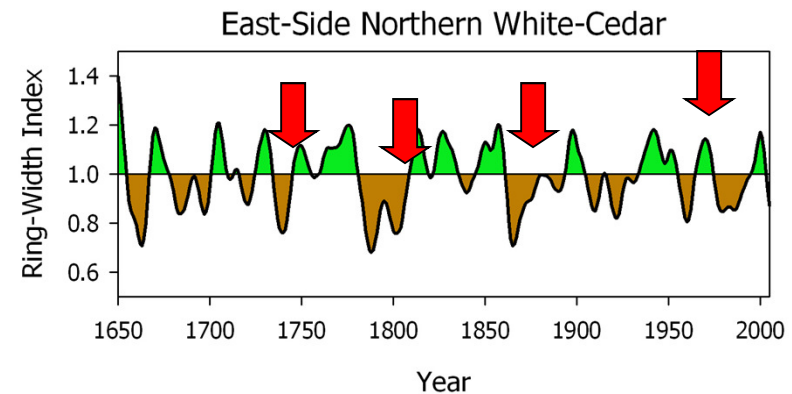
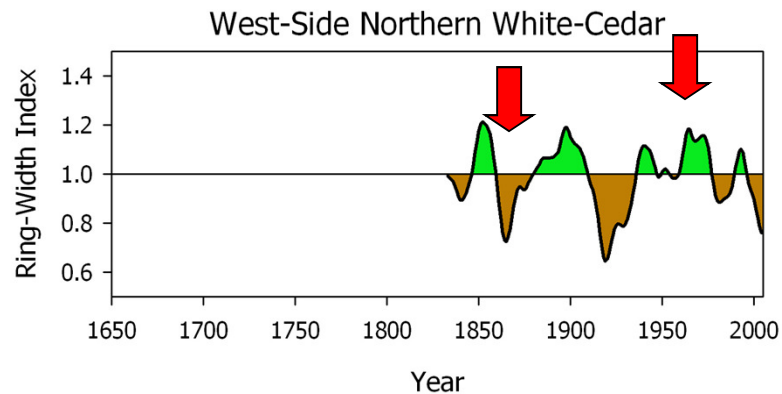
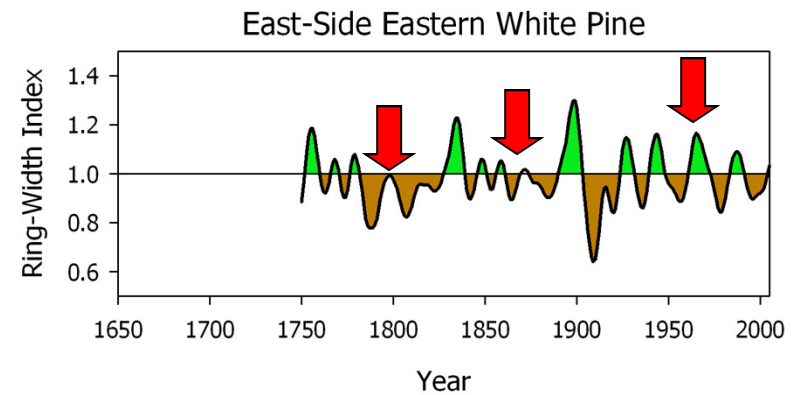
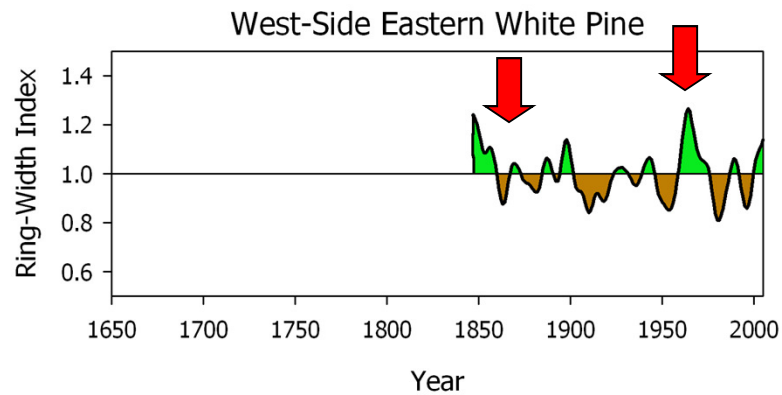
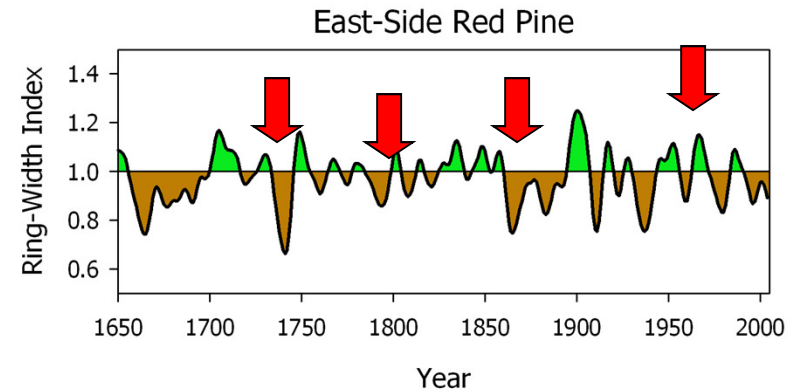
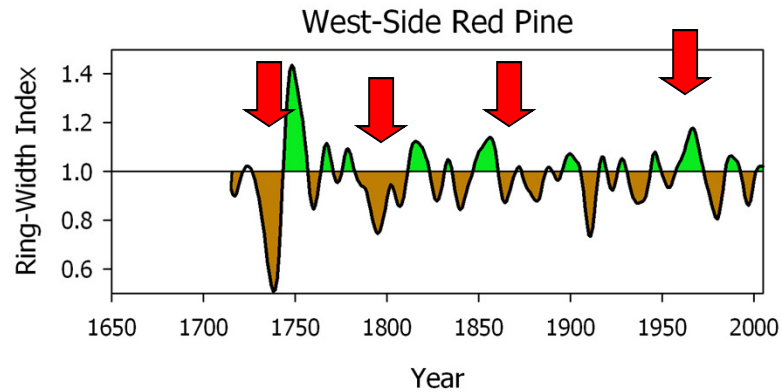


- ★ Recent Sampling Locations
- ★ Prior Sampling Efforts

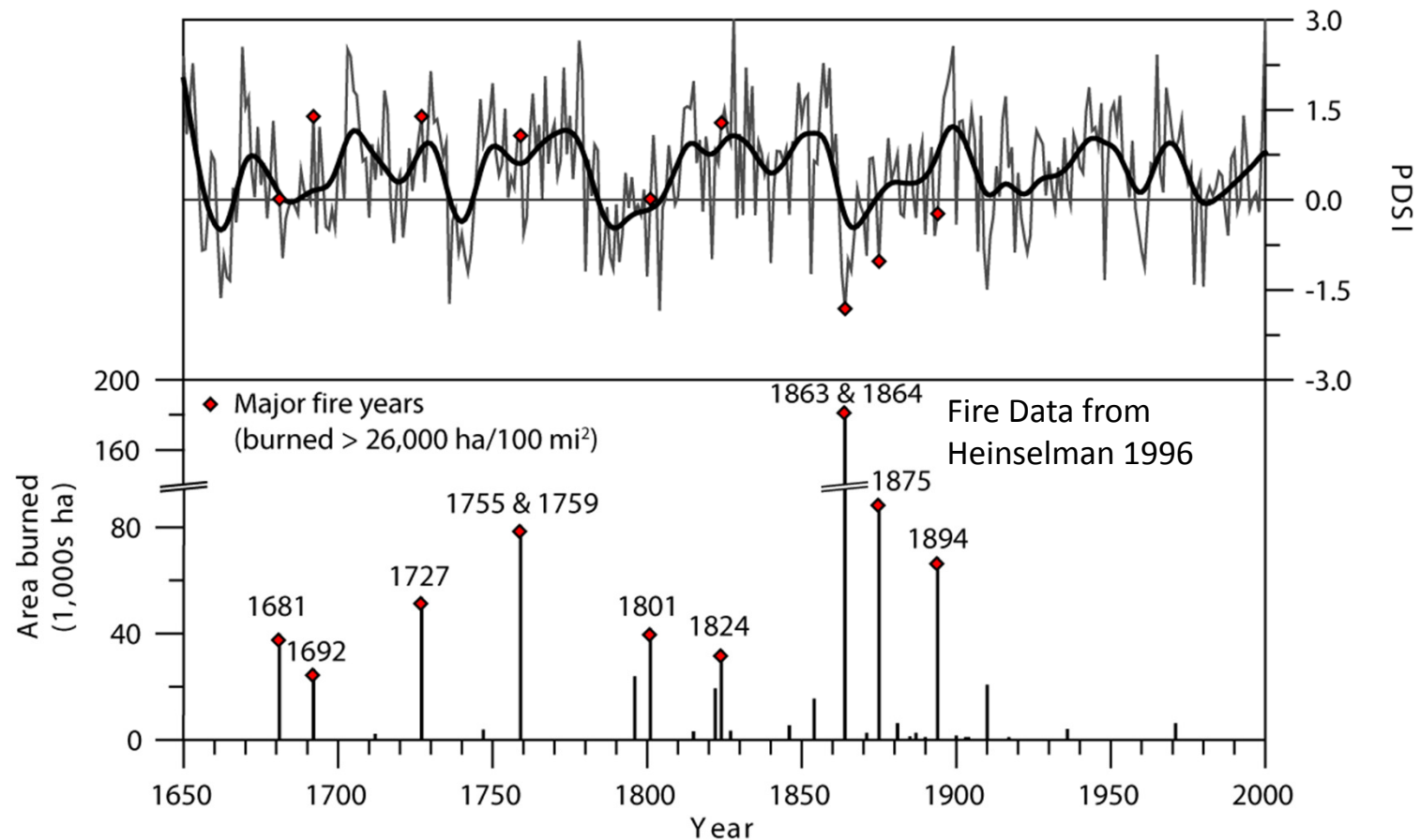
- Multiple species at each site.
 - Red Pine (*Pinus resinosa*)
 - White Pine (*Pinus strobus*)
 - Northern White-Cedar (*Thuja occidentalis*)
- Previous red pine chronologies
- Chronologies aggregated within a region.



Regional Growth Patterns

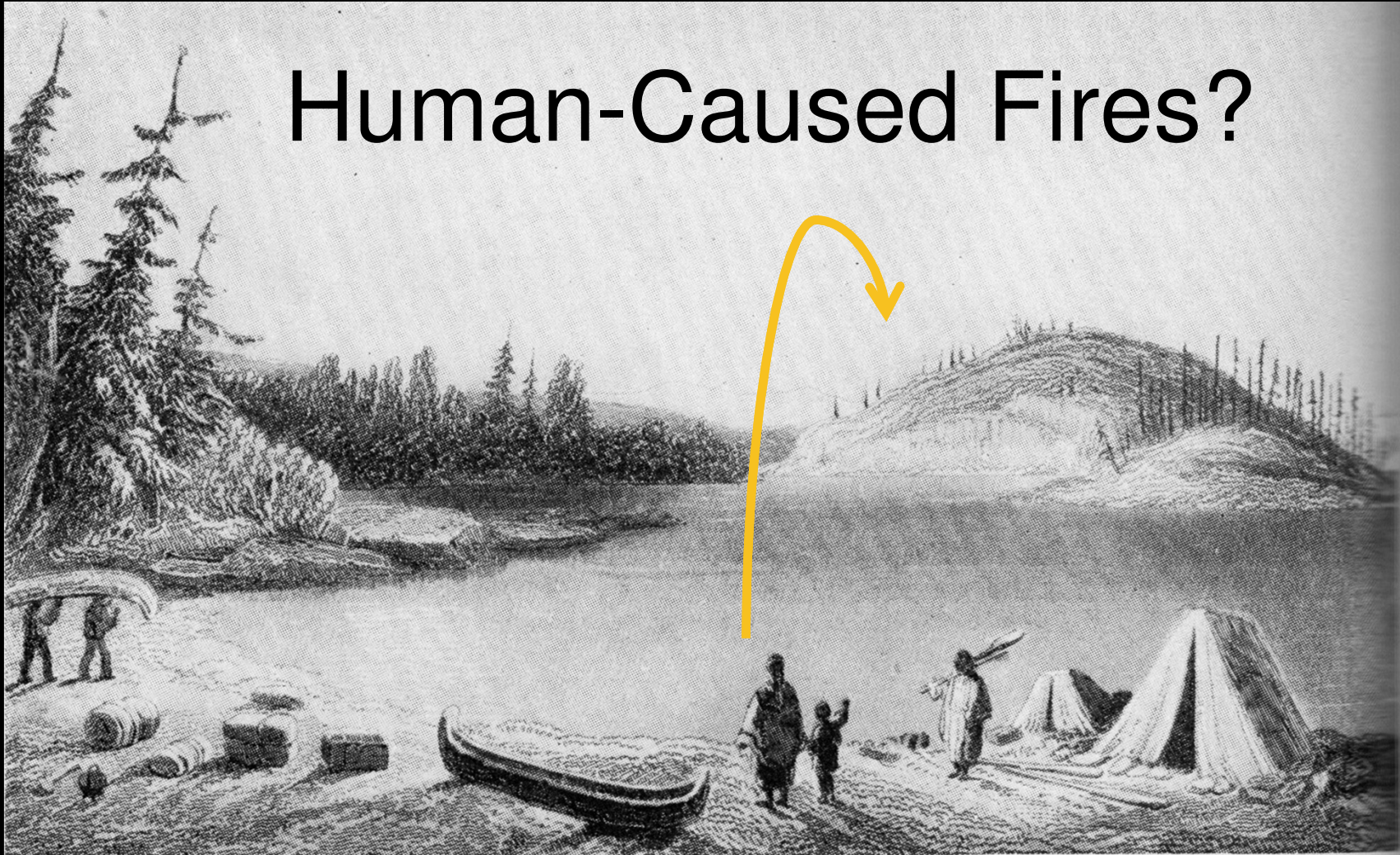


Drought and Fire in the BWCAW



Research Problem

Human-Caused Fires?



Sketch of Lac La Croix in 1823 by Dr. John Bigsby from his journal,
The Shoe and Canoe



Minnesota Place Names by Warren Upham : Lac La Croix –

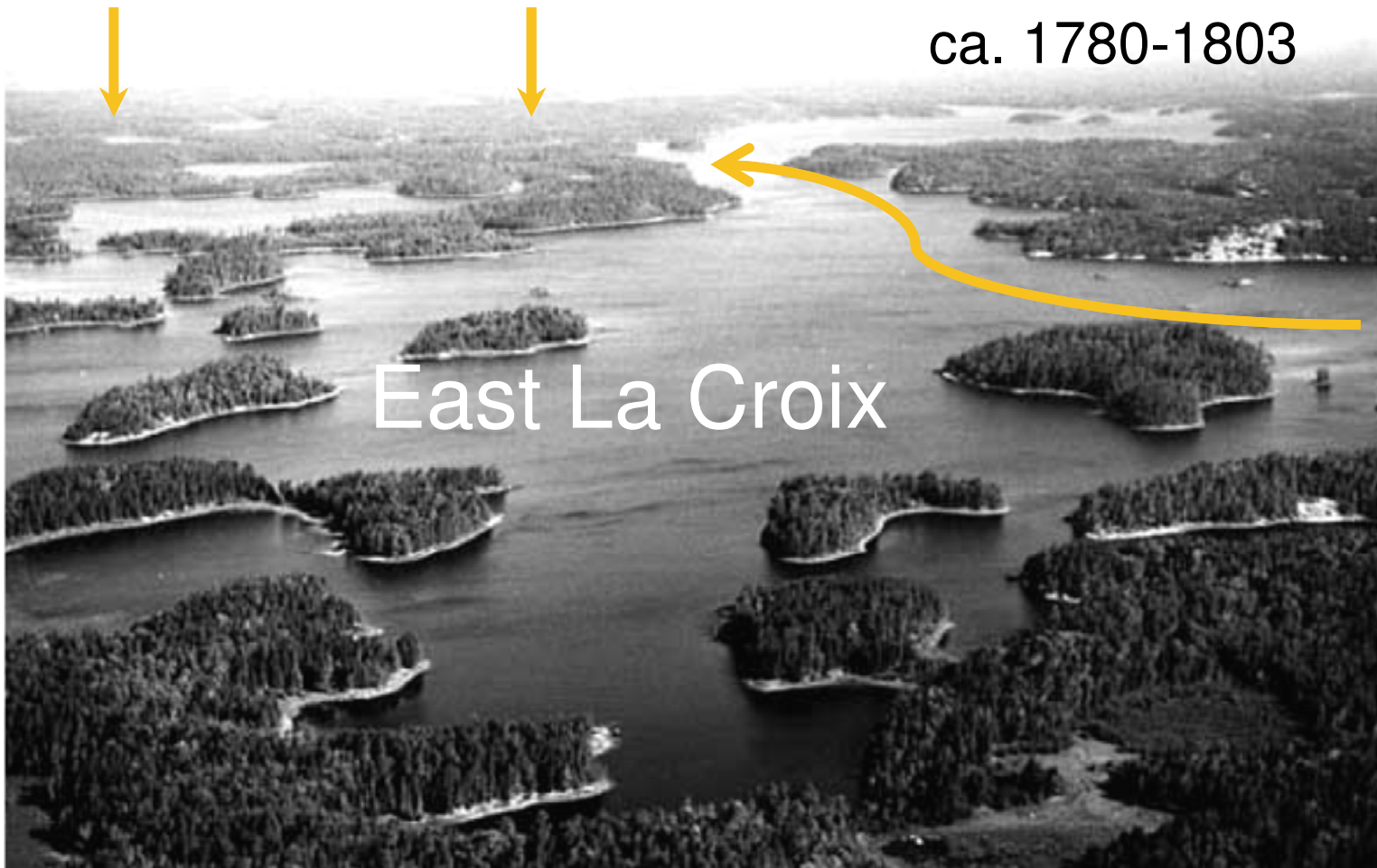
Called "Sheshibagumag sagaigun", by the local Ojibwe, "the lake where they go every which way to get through."



Study Area

Trade Route
ca. 1780-1803

East La Croix



Research Questions

A dramatic sunset over a body of water. The sun is a bright orange orb on the right side of the horizon, casting a shimmering reflection on the water. A massive, dark, and billowing plume of smoke or ash rises from the horizon, partially obscuring the sky. The sky is a mix of dark, heavy clouds and lighter, hazy areas. The water in the foreground shows gentle ripples and reflects the colors of the sunset.

1.) Are the island fire histories of eastern Lac La Croix synchronous across space and in time?

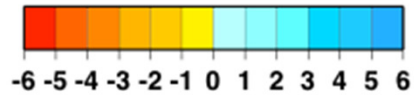
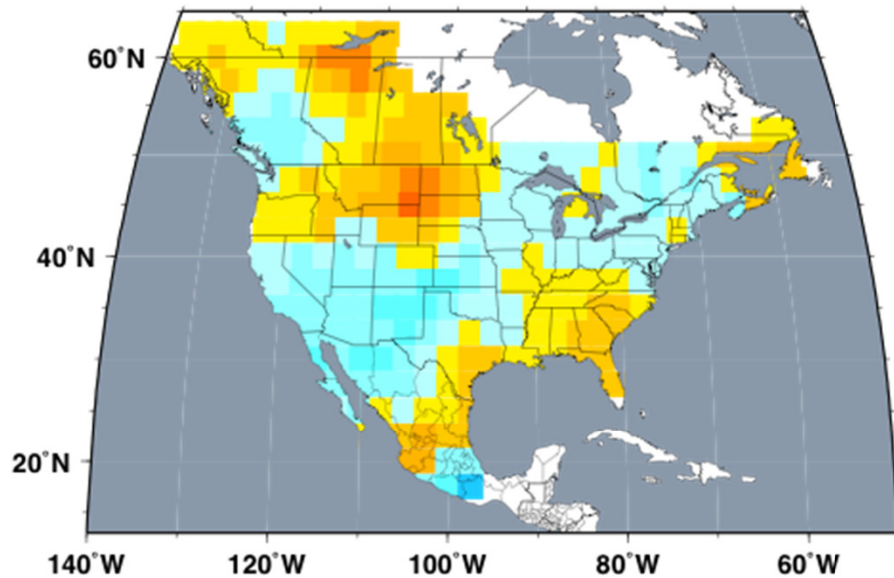


Research Questions

2.) Are the island fire histories of Lac La Croix strongly associated with years of regional drought?

TREE-RING RECONSTRUCTED DROUGHT

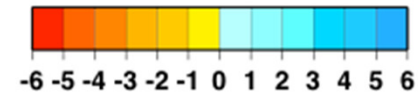
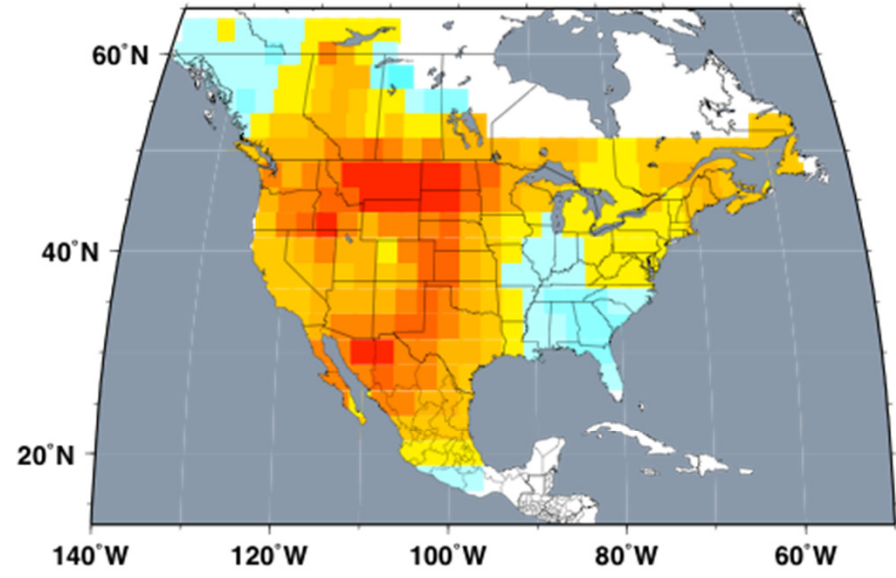
1712



PDSI

TREE-RING RECONSTRUCTED DROUGHT

1863

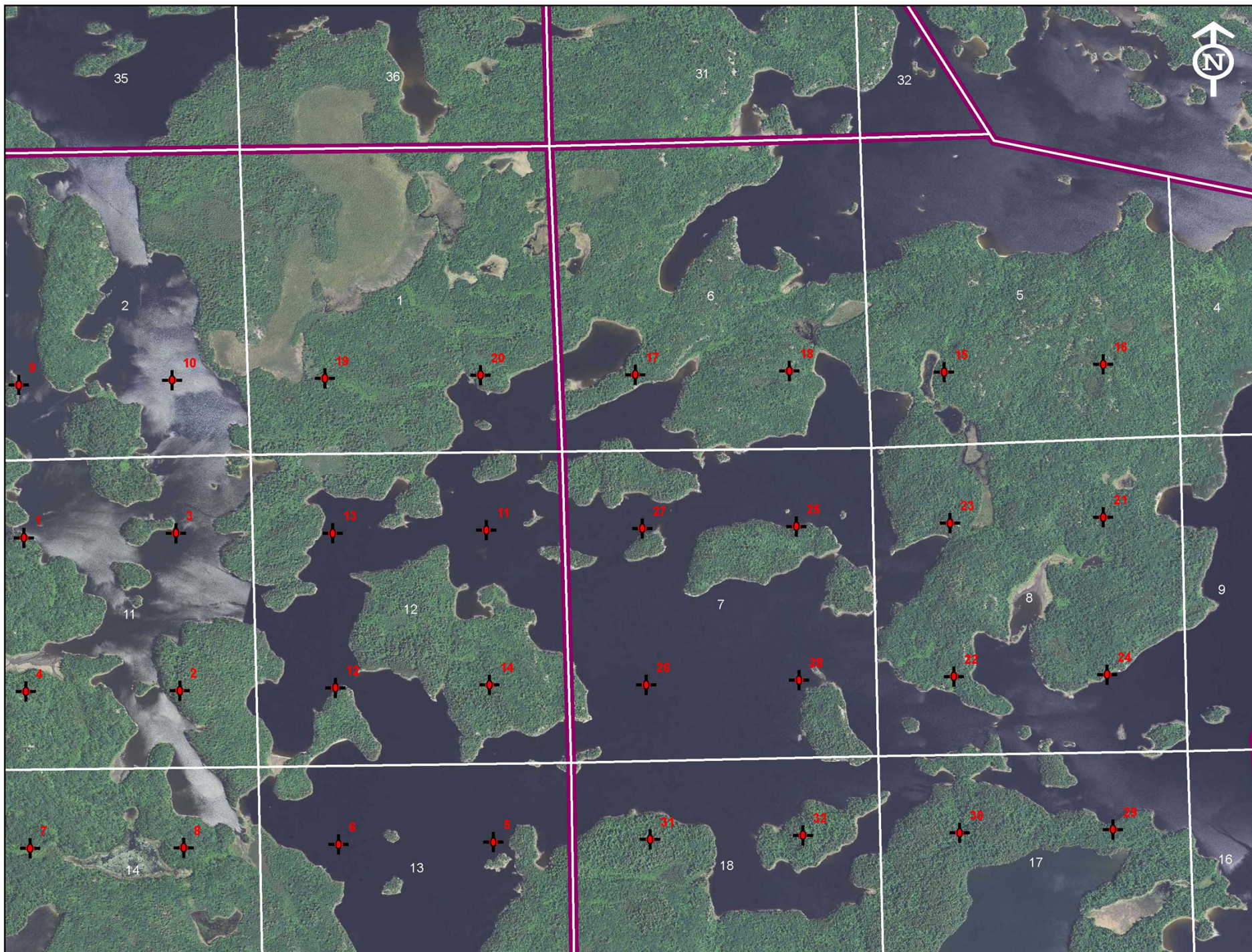


PDSI

North American Drought Atlas (Cook et. al 2004)

METHO

DS



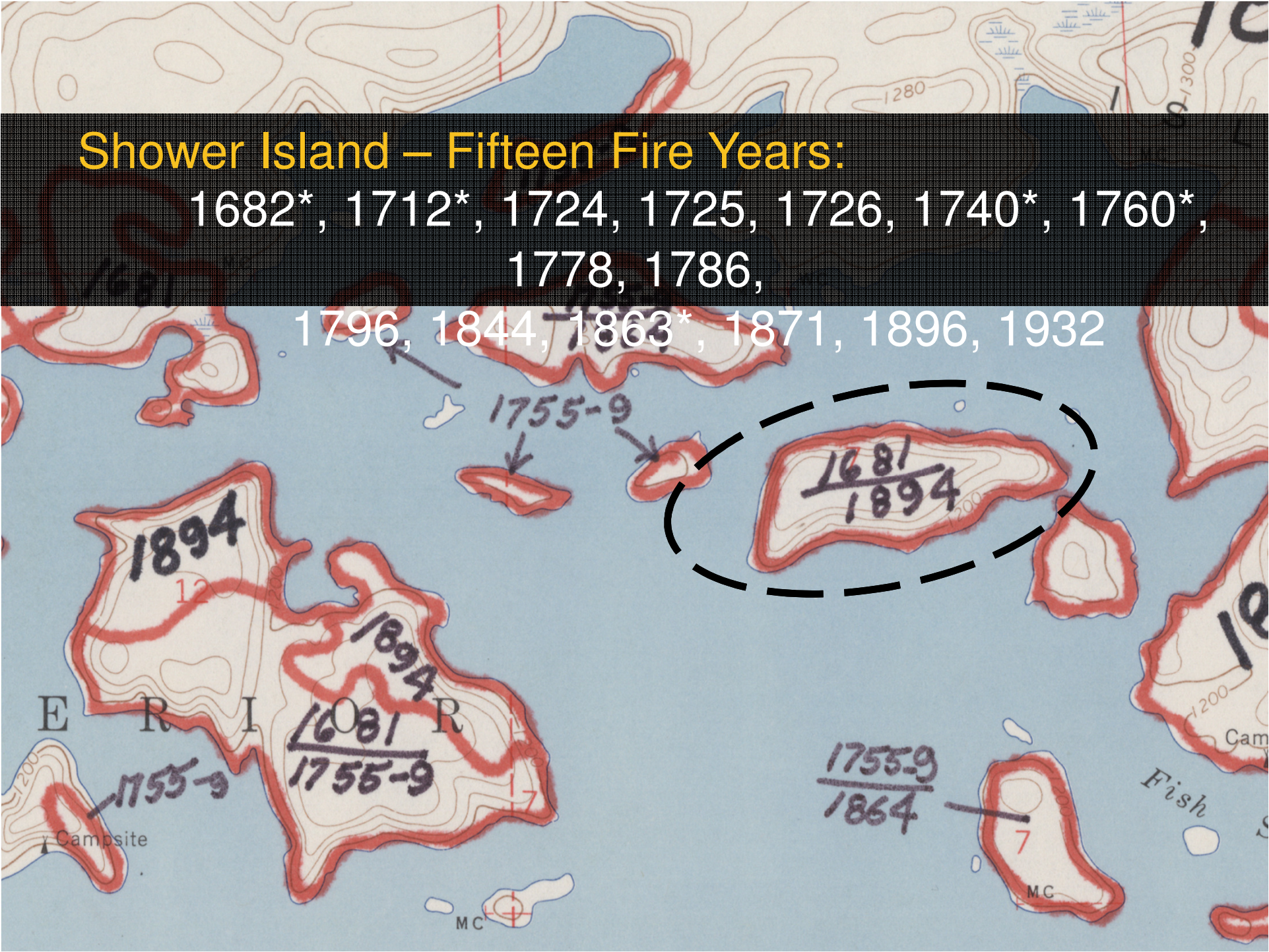










[illegible][illegible]

Penny Island – Nine Fire Years

1682*, 1695, 1740*, 1759, 1770, 1789, 1820, 1870,

1923



Pit Island – Ten Fire Years

1636(v), 1654-55, 1671-73, 1682*, 1740*, 1758,
1762(v) 1767, 1780, 1802





A painting of a forest scene with a small island in the distance. The scene is set in a dense forest with tall, dark trees. In the upper left, a small island with some vegetation is visible against a blue sky with a few clouds. The overall tone is dark and atmospheric.

Journal Entry from a Hudson Bay fur trader on Lake of the Woods:

“I immediately went out and set fire to the island to make a smoak [sic] signal for the Indians (a signal used among themselves) for them to do the same [B 155/a/2].”

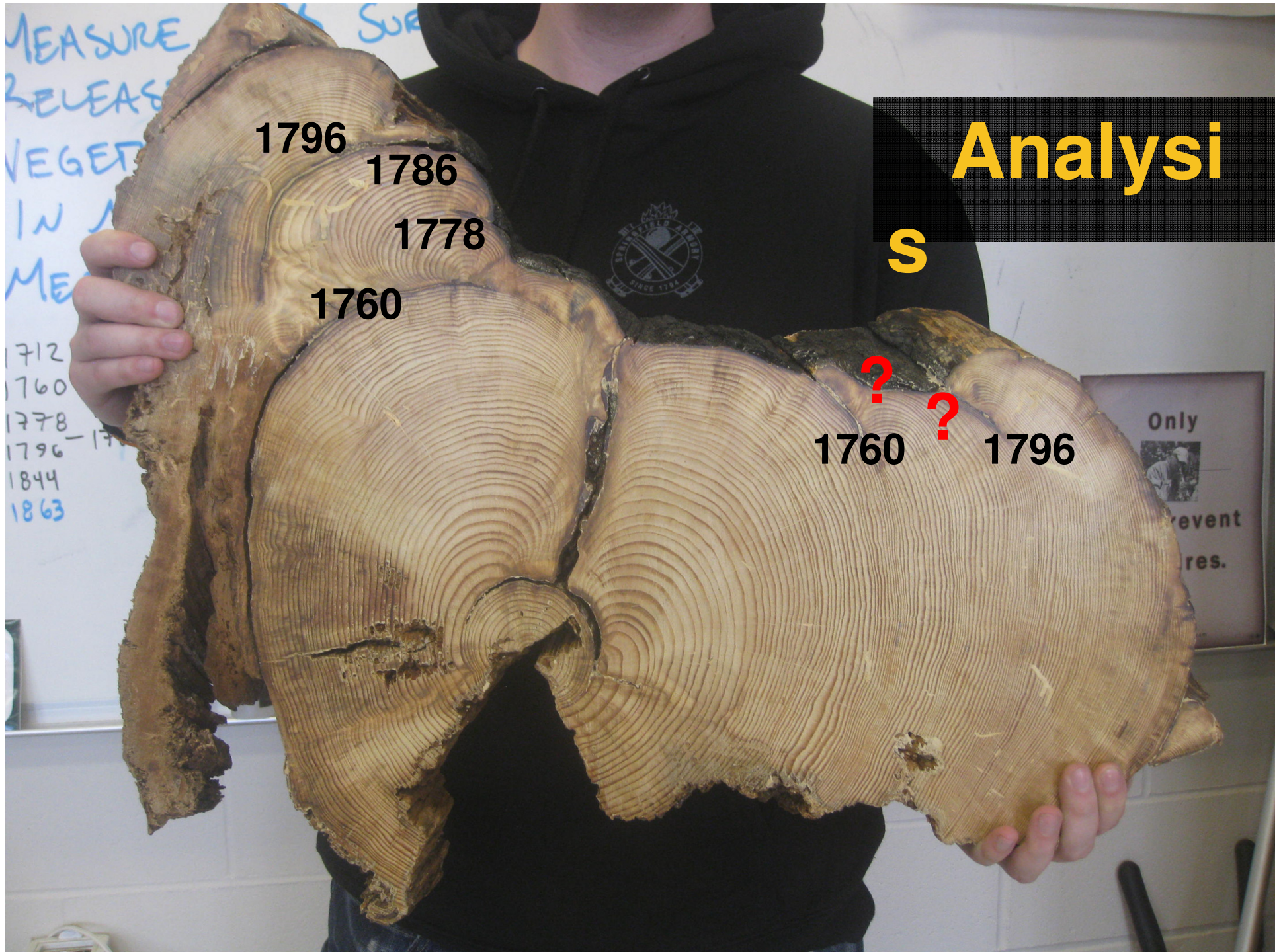


CHALLENGES



Finding Quality Samples





Analysis

S

1796

1786

1778

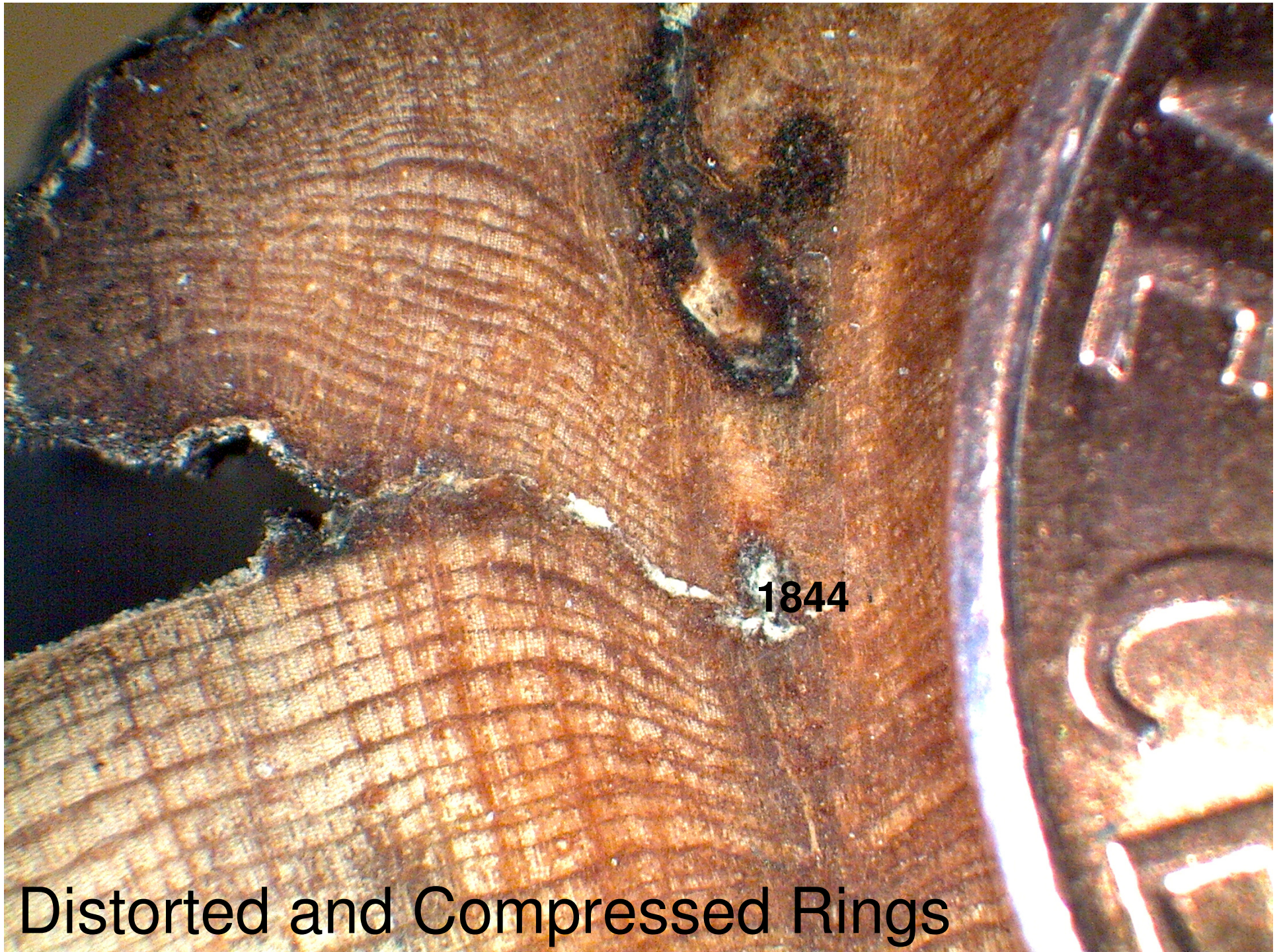
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1760

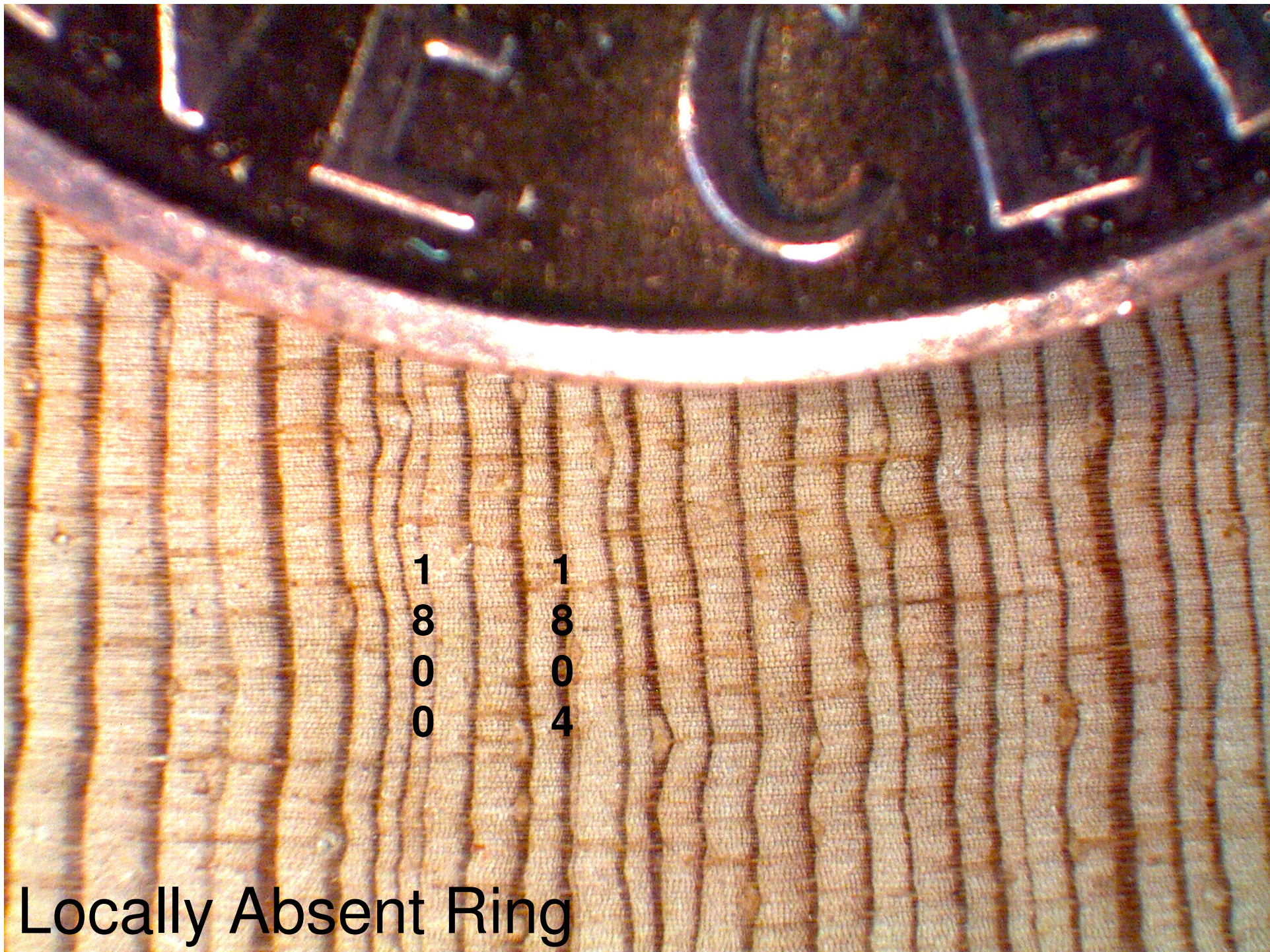
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1796



1844

Distorted and Compressed Rings



1
8
0
0

1
8
0
4

Locally Absent Ring

Research Realizations

1770

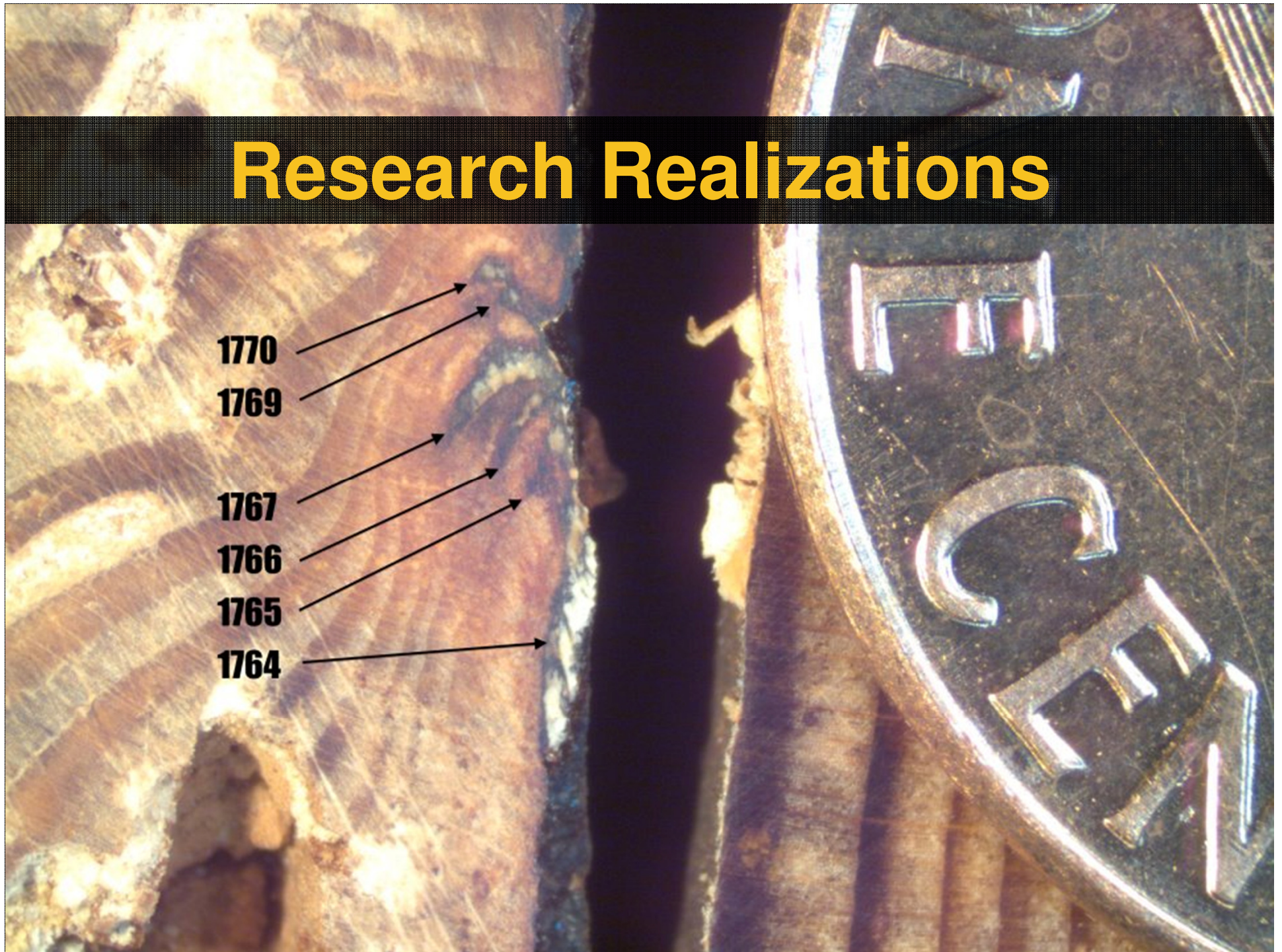
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1767

1766

1765

1764





Interdisciplinary

Tree-ring based studies of fire history are desirable to help justify (or adapt) current fire management practices on the Superior NF



Culture: A significant ecological variable that should be considered in fire history

research



An aerial photograph showing a complex forest mosaic. A large, dark blue lake occupies the upper right portion of the image. The surrounding forest is a patchwork of different colors and textures, indicating various forest types and stages of succession. A prominent area of bright green forest is visible in the lower center, surrounded by darker, more uniform forest areas. The overall scene illustrates the diversity of a forest landscape.

Can lightning ignited fires alone maintain the diversity of the historic forest mosaic?

Photo: For MPR by Steve Foss

How should (wild)fire be managed in the BWCAW?



Photo: MIFC





Take Home

Points

A scenic photograph of a calm lake with forested islands and rocky shorelines under a cloudy sky. The water is a deep blue-grey, reflecting the sky. In the foreground, dark, jagged rocks protrude from the water. In the middle ground, two small, densely forested islands are visible. The sky is filled with soft, white clouds. A large yellow number '1' is overlaid on the left side of the image.

1

We are successfully developing an annually-resolved 350+ year record of fires from red pine stumps in the BWCAW.



2

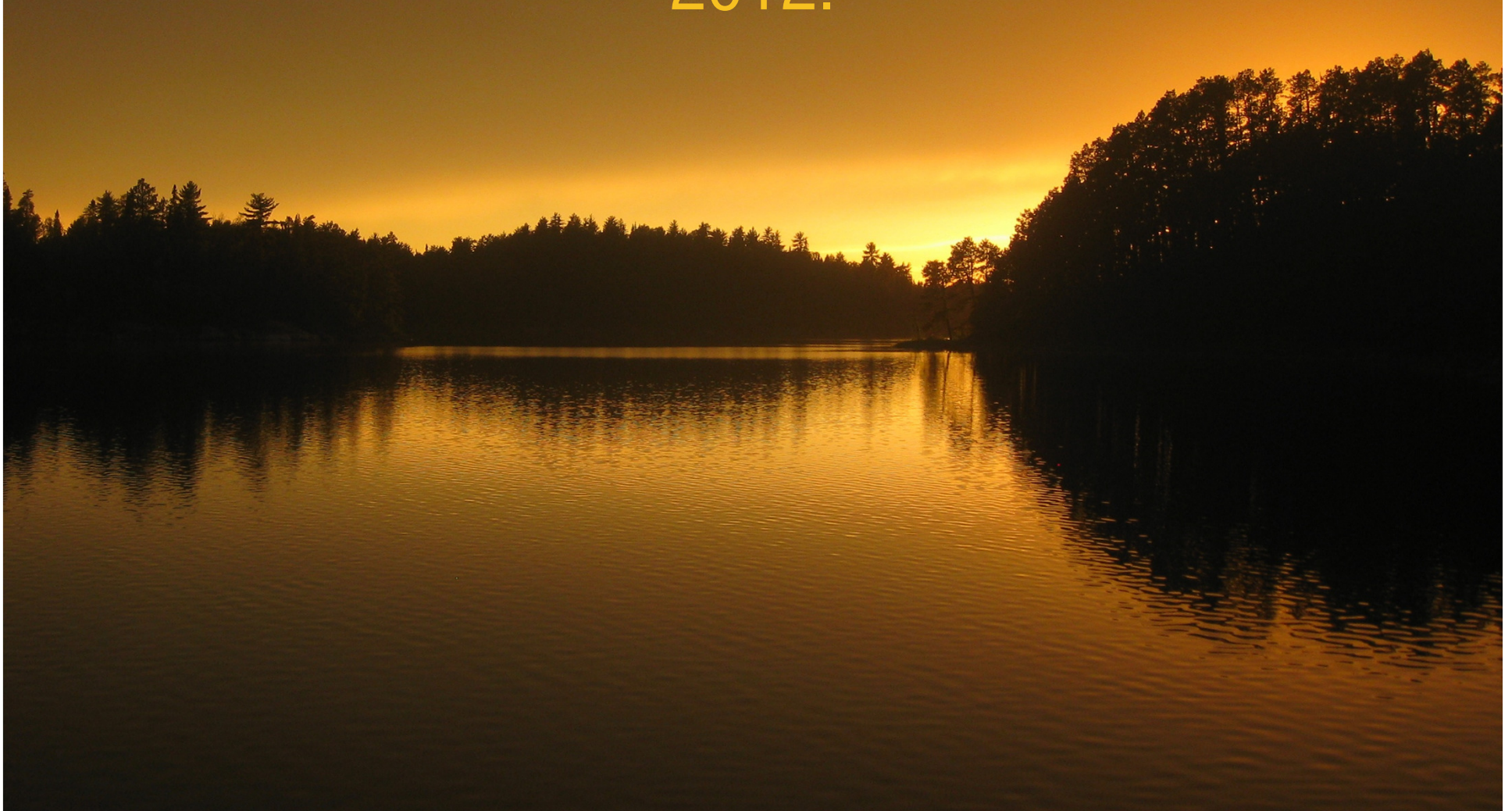
We have the ability to refine and enhance Heinselman's stand origin maps for the BWCAW.

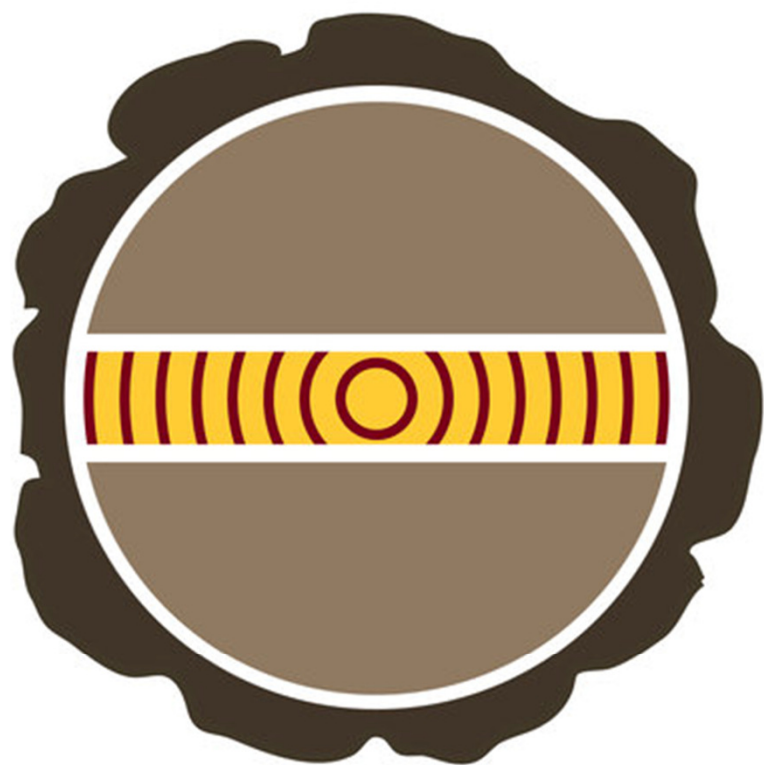


3

Multi-century reconstructions of surface fires can be compared to existing records of drought and human use to explore fire drivers at the local scale from year to year.

A comprehensive project report will be written and defended as my Master's thesis by September 2012.





**Center for
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